

WHAT IS CLAIMED IS:

1. An oscillatory neural network computer, comprising:

a weighting network having a plurality of output terminals, the weighting network having phase-based connection strengths; and  
a plurality of phase-locked loop circuits operably coupled with said weighting network.

2. The oscillatory neural network computer of claim 1, wherein the weighting network comprises:

first and second weighting circuits, each of the first and second weighting elements having input and output terminals;

a first adder circuit having first and second input terminals and an output terminal, the first input terminal of the first adder circuit coupled to the output terminal of the first weighting circuit and the second input terminal of the first adder circuit coupled to the input terminal of the second weighting circuit; and

a first bandpass filter circuit having input and output terminals, the input terminal of the first bandpass filter circuit coupled to the output terminal of the first adder circuit.

3. The oscillatory neural network computer of claim 2, further including:

third and fourth weighting circuits, each of the third and fourth weighting circuits having input and output terminals;

a second adder circuit having first and second input terminals and an output terminal, the first input terminal of the second adder circuit coupled to the output terminal of the third weighting circuit and the second input terminal of the second adder circuit coupled to the input terminal of the fourth weighting element; and

a second bandpass filter circuit having input and output terminals, the input terminal of the second bandpass filter circuit coupled to the output terminal of the second adder circuit.

- 1 4. The oscillatory neural network computer of claim 2, wherein the plurality of phase-  
2 locked loop circuits comprises a phase-locked loop circuit having an output terminal coupled  
3 to the input terminal of the first weighting circuit.
- 1 5. The oscillatory neural network computer of claim 4, further including a first  
2 initialization input terminal coupled to the adder circuit.
- 1 6. The oscillatory neural network computer of claim 1, wherein the weighting network  
2 comprises a plurality of weighting circuits coupled to a plurality of bandpass filter circuits  
3 through a plurality of adder circuits.
- 1 7. The oscillatory neural network computer of claim 6, wherein each weighting circuit  
2 comprises a linear amplifier.
- 1 8. The oscillatory neural network computer of claim 7, wherein each weighting circuit  
2 further comprises a phase shift circuit coupled to the linear amplifier.
- 1 9. The oscillatory neural network computer of claim 1, wherein the weighting elements  
2 comprise a phase shift circuit.
- 1 10. The oscillatory neural network computer of claim 1, wherein the weighting circuit  
2 further includes a plurality of initialization input terminals.
- 1 11. An oscillatory neural network computer, comprising:  
2 a plurality of connectors, wherein each connector has a phase-encoded connection  
3 coefficient; and  
4 a plurality of oscillators operably coupled with said plurality of connectors.
- 1 12. The oscillatory neural network computer of claim 11, further including a plurality of  
2 adder circuits coupled between the plurality of connectors and said plurality of oscillators.

14. The oscillatory neural network computer of claim 13, wherein the plurality of connectors comprises first, second, third, and fourth connectors, the plurality of adder circuits comprises at least two adder circuits, and wherein the output terminals of first and second connectors are coupled to the input terminals of a first adder circuit and the output terminals of third and fourth connectors are coupled to the input terminals of the second adder circuit.

1     15.     The oscillatory neural network computer of claim 14, wherein the plurality of  
2     oscillators includes a first oscillator having an output terminal coupled to the first and third  
3     connectors and a second oscillator having an output terminal coupled to the second and fourth  
4     connectors.

1        16.        The oscillatory neural network computer of claim 15, further including a first  
2        initialization terminal coupled to the first adder circuit and a second initialization terminal  
3        coupled to the second adder circuit.

1     17.     The oscillatory neural network computer of claim 11, wherein the plurality of  
2     connectors comprises a linear amplifier coupled to a phase shift circuit.

1 18. A method for recognizing an incoming pattern using a neural network computer  
2 comprising a phase deviation between a learned pattern and the incoming pattern to create an  
3 output signal indicative of the learned pattern.

1     19.     The method of claim 18, wherein using the phase deviation includes encoding  
2     connection coefficients of the neural network computer in accordance with phase  
3     representations of the learned pattern.

- 1 20. A method for programming a neural network computer comprising encoding
- 2 connection coefficients of the neural network computer in accordance with phase relationships
- 3 of a pattern to be learned.